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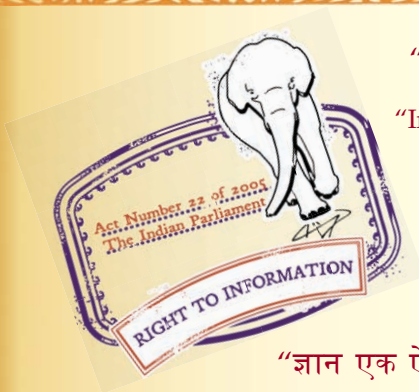
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IS 9175-21 (1987): Rationalized Steels for the Automobile and Ancillary Industry, Part 21: Mechanical and Physical Properties of 40Cr4 Grade Steel [MTD 16: Alloy Steels and Forgings]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

**SPECIFICATION FOR
RATIONALIZED STEELS FOR
THE AUTOMOBILE AND ANCILLARY INDUSTRY**

PART 21 MECHANICAL AND PHYSICAL PROPERTIES OF 40Cr4 GRADE STEEL

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR RATIONALIZED STEELS FOR THE AUTOMOBILE AND ANCILLARY INDUSTRY

PART 21 MECHANICAL AND PHYSICAL PROPERTIES OF 40Cr4 GRADE STEEL

0. FOREWORD

0.1 This Indian Standard (Part 21) was adopted by the Bureau of Indian Standards on 29 October 1987, after the draft finalized by the Co-ordinating Committee on Materials for Automobiles had been approved by the Structural and Metals Division Council.

0.2 Part 1 of IS : 9175* was published in 1979 which covers the chemical composition of 33 rationalized steels. The mechanical properties, hardenability and isothermal transformation characteristics of these 33 rationalized steels are

*Specification for rationalized steels for the automobile and ancillary industry: Part 1 Chemical composition.

being covered in different parts of this standard (Parts 2 to 34). The data concerning these properties given in this standard is only for guidance and information purposes.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (revised).

1. SCOPE

1.1 This standard (Part 21) covers the chemical composition, mechanical properties, hardenability and isothermal transformation characteristics of 40Cr4 grade of steel for use by automobile and ancillary industry.

1.2 This is an alloy steel, intended to be supplied in the hardened and tempered condition.

2. CHEMICAL COMPOSITION

2.1 The chemical composition of this grade of steel shall be as given below:

Constituents, Percent					
C	Si	Mn	Cr	S	P
0.35-	0.10-	0.60-	0.90-	0.035,	0.035,
0.45	0.35	0.90	1.20	Max	Max

3. HARDNESS

3.1 The maximum hardness for this grade of steel delivered in the annealed condition when determined in accordance with IS : 1500-1983* shall be 250 HB.

*Method for Brinell hardness test for metallic materials (second revision).

4. MECHANICAL PROPERTIES

4.1 The mechanical properties of this grade of steel in the hardened and tempered condition when determined in accordance with IS : 1598-1977* and IS : 1608-1972† shall be as given in Table 1.

TABLE 1 MECHANICAL PROPERTIES IN THE HARDENED AND TEMPERED CONDITION

LIMITING RULING SECTION	TENSILE STRENGTH	0.2 PER- CENT PROOF STRESS, Min	ELON- GATION G.L. 5.65 √So, Min Percent	IZOD IM- PACT, Min Joules	BRINELL HARDNESS HB
(1)	MPa (2)	MPa (3)	(4)	(5)	(6)
100	690-840	490	14	55	201-248
63	790-940	550	12	50	229-277
30	890-1040	650	11	50	255-311

5. HOT WORKING AND HEAT TREATMENT TEMPERATURES

5.1 The recommended hot working and heat treatment temperatures shall be as given below:

a) Forging/rolling temperature 1 200°C, Max

*Method of Izod impact test of metals (first revision).
†Method for tensile testing of steel products (first revision).

- b) Normalizing temperature 850-880°C
- c) Hardening temperature 850-880°C
- d) Tempering temperature 680°C, *Max*

6. TRANSFORMATION CHARACTERISTICS

6.1 The isothermal transformation diagrams for this grade of steel are given in Fig. 1.

7. HARDENABILITY

7.1 The end quench hardenability band is given in Fig. 2.

8. EFFECT OF TEMPERING ON MECHANICAL PROPERTIES

8.1 The curves for the effect of tempering on the mechanical properties of the steel is given in Fig. 3.

9. EFFECT OF SECTION SIZE ON MECHANICAL PROPERTIES

9.1 The curves for the effect of section size on mechanical properties are given in Fig. 4 to 6.

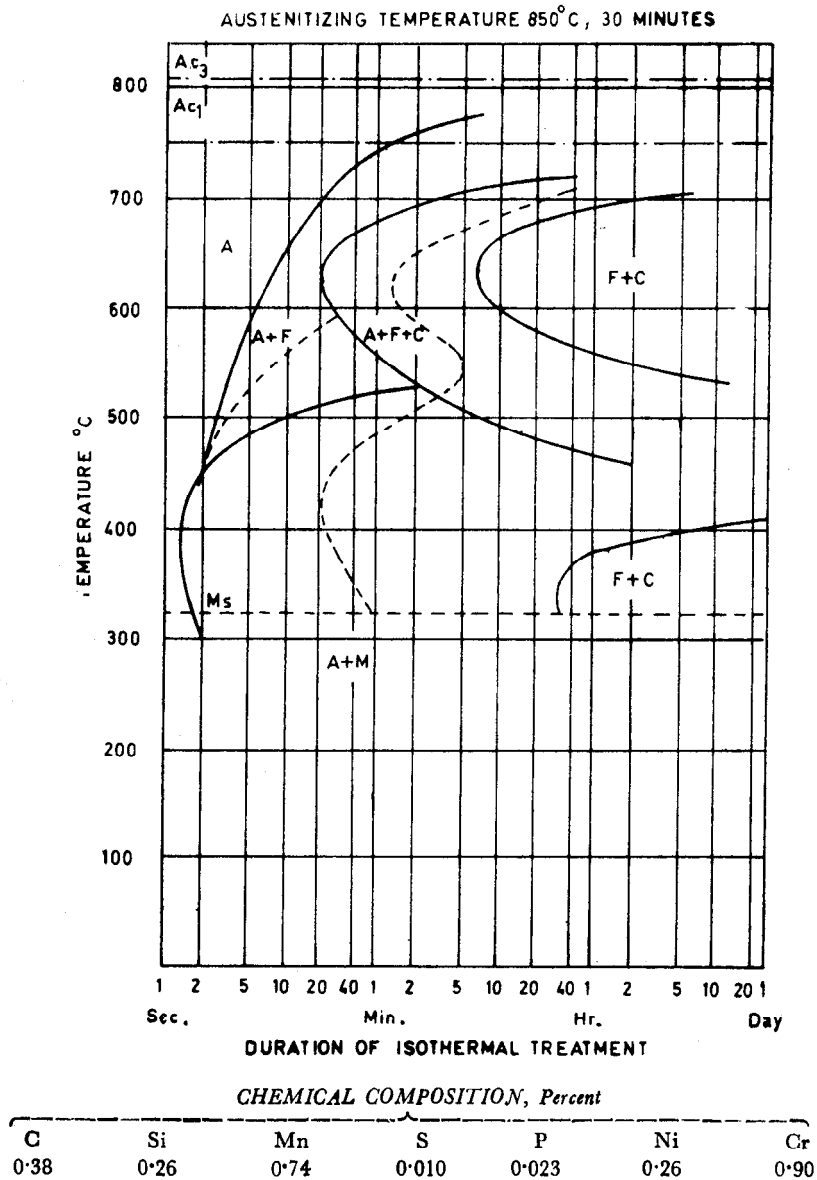


FIG. 1 ISOTHERMAL TRANSFORMATION DIAGRAM OF 40Cr4 GRADE STEEL

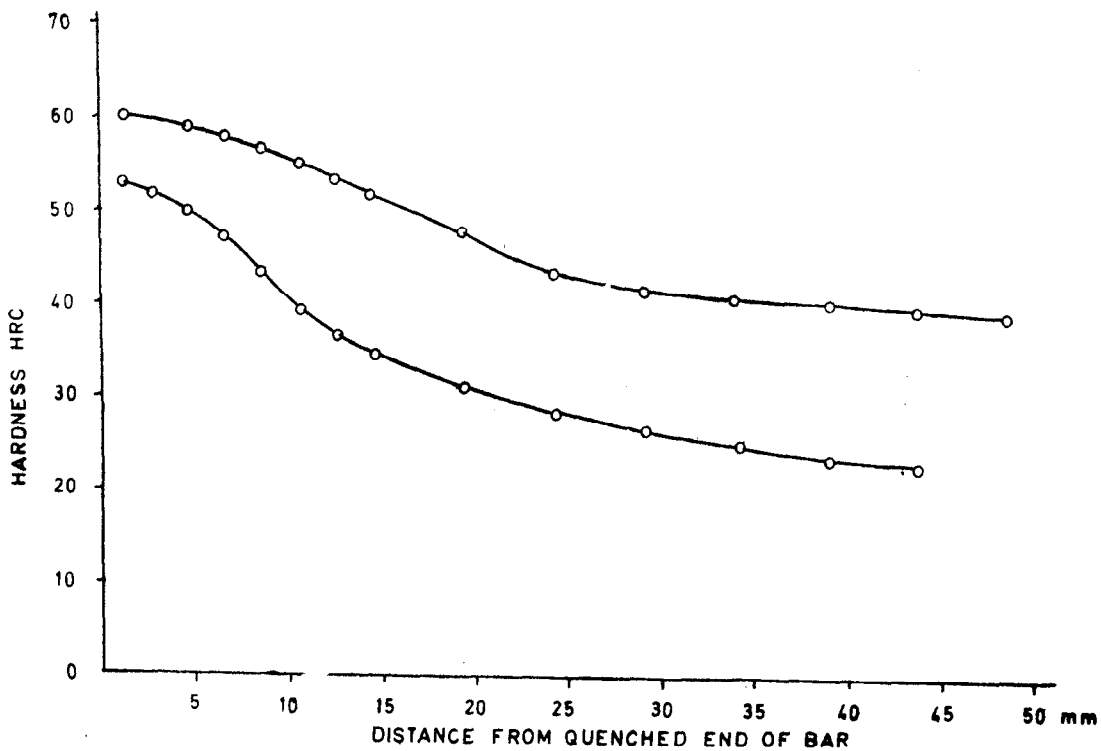


FIG. 2 END QUENCH HARDENABILITY BAND OF 40Cr4 GRADE STEEL

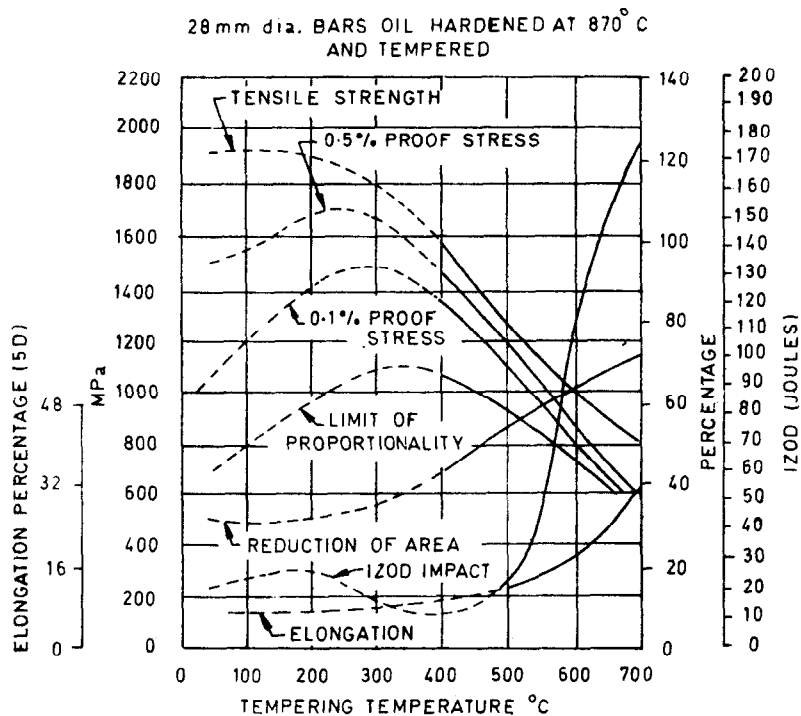


FIG. 3 CURVES SHOWING THE EFFECT OF TEMPERING TEMPERATURE ON MECHANICAL PROPERTIES OF 40Cr4 GRADE STEEL

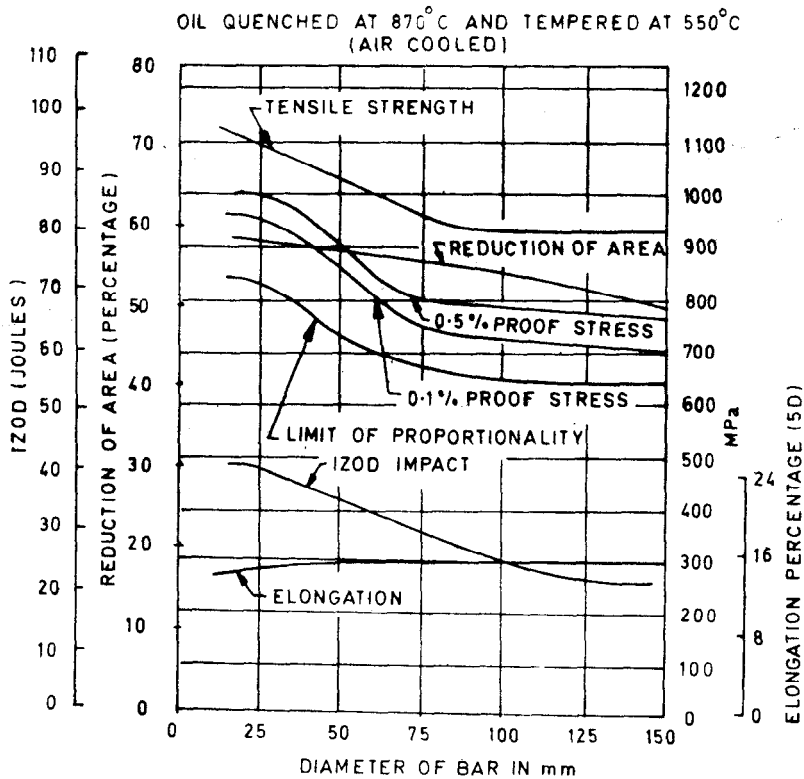


FIG. 4 CURVES SHOWING THE EFFECT OF SECTION SIZE ON MECHANICAL PROPERTIES OF 40Cr4 GRADE STEEL

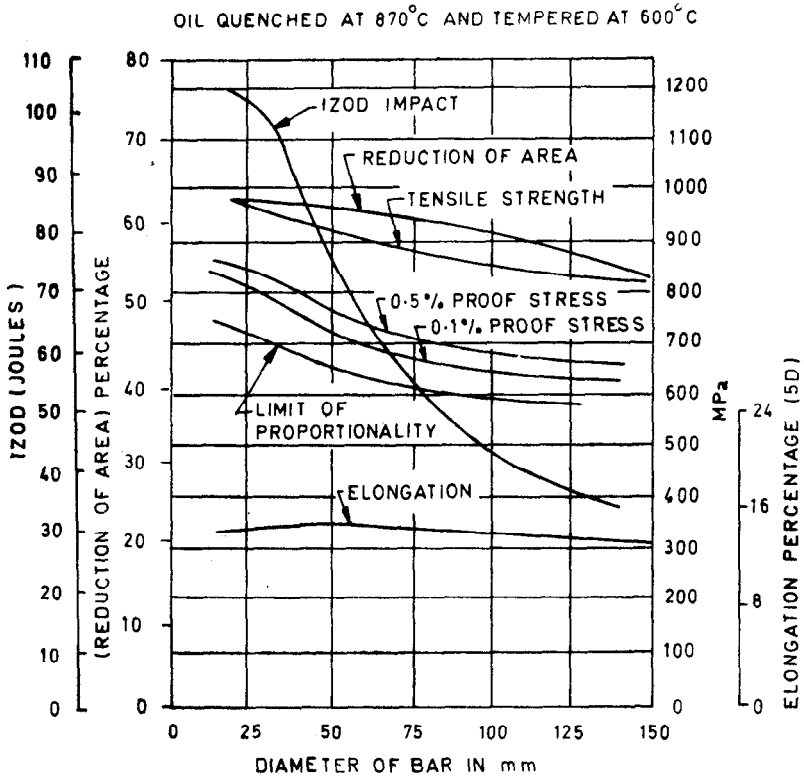


FIG. 5 CURVES SHOWING THE EFFECT OF SECTION SIZE ON MECHANICAL PROPERTIES OF 40Cr4 GRADE STEEL

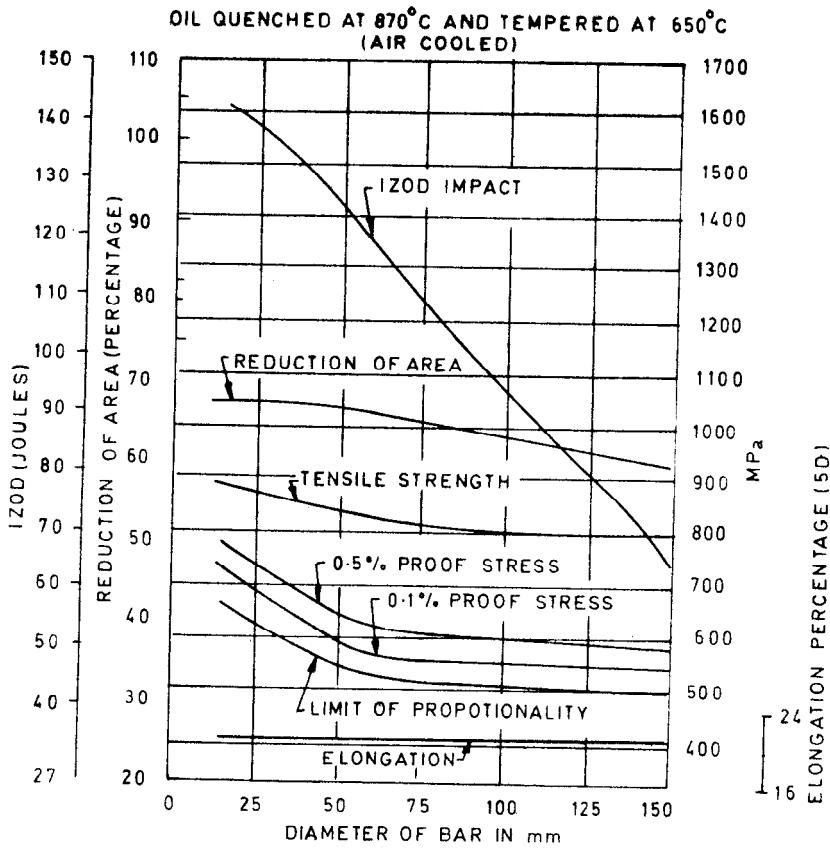


FIG. 6 CURVES SHOWING THE EFFECT OF SECTION SIZE ON MECHANICAL PROPERTIES OF 40Cr4 GRADE STEEL

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